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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/703,264	10/31/2000	James C.H. Thi	2875.0490001	9016

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EXAMINER

JAMAL, ALEXANDER

ART UNIT	PAPER NUMBER
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2614

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12/05/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<p align="center">Office Action Summary</p>	<p>Application No.</p> <p>09/703,264</p>	<p>Applicant(s)</p> <p>THI ET AL.</p>	
	<p>Examiner</p> <p>Alexander Jamal</p>	<p>Art Unit</p> <p>2614</p>	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Based upon the submitted amendment (9-10-2007) entered via RCE, the examiner notes that claims 1,11,22,33,37 have been amended.
2. Examiner notes that applicant's use of the term 'echo' as applied to the signal coupling between the (Fig. 7) audio source 326 and microphone 330 is read as a 'near-end noise source' by the examiner. The audio signal is not 'echoing' back towards the far end (Sout) because it does not originate from the far end (Fin). It is an audible noise source present at the near end that does not originate from the Far end system to which the near end device is communicating with.
3. Examiner notes that it is not common for a terminal with a speaker and microphone (such as a speakerphone) to also have a traditional 2wire-4wire hybrid at the **same** end as the speaker and microphone are located (as shown in applicant's figure 7). Examiner requests applicant to clarify the electrical echo formed by a 'hybrid' at the same end as an outputting speaker and an inputting microphone. For the purposes of examination, the examiner reads the 'Hybrid H' in Fig. 7 of applicant's specification to mean any electrical means (such as parasitic capacitances between circuit components ect.) that couple an unwanted portion of the signal $V(n)$ into the near end signal received from microphone 330.

4. Examiner notes that applicant has offered an explanation as to the acoustic and electrical interfaces of Fig. 7 (remarks pages 10,11). However, applicant has not explained how a single DAC 322 can effectively drive both a speaker a bidirectional communications hybrid with the same signal. This is not a common configuration and applicant's specification gives no insight as to how this would be done. For the purposes of examination, the examiner maintains that the only electrical echo that may be produced by hybrid H of Fig. 7, is parasitic electrical echo between components on the circuit board. Examiner notes that these components will be read as 'echo' by the echo canceller W because it is added to the signal after the echo canceller W receives it's outgoing reference signal 301a. Examiner also notes that the canceller of Eppler and Finn would also function to remove any parasitic hybrid electrical echo coupled after the outgoing reference signal was received by the echo canceller.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 1-39 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per **claims 1-39**, the claims recite the term 'dynamically' updated coefficients. Applicant discusses the term 'dynamically' in the arguments (page 12). Applicant states that 'dynamically' refers to the coefficients being updated based on far end voice and requiring no intermittent training period (remarks page 12). However, it is not clear what defines an intermittent training period. Any signal processing system requires a finite amount of processing time to process signals. Adaptive filters require finite periods of time to update their coefficients based on adaptive algorithms. With applicant's definition of the term 'dynamic' it is not clear what would differentiate a 'training period' from 'dynamic updating' being referred to by applicant. A training period occurs for a finite period of time at a prescribed time, using a transmitted audio signal (white noise). There is no specific element to differentiate a 'training period' from an ongoing update as the training period may be repeated as many times as desired. Therefore, it is not clear what is meant by the term 'dynamic' used in the claims.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3,6,8-12,14,15,17-20,22,23,25,27-31,33,36,37 are rejected under 35

U.S.C. 103(a) as being unpatentable over Eppler Jr. et al (5600714), and further in view of Finn (5706344).

As per **claim 1**, Eppler discloses an echo canceller (in a communications system) comprising a single dynamic adaptive filter 24 with a single transfer function formed with coefficients and adapted to cancel an echo in a near end signal (from microphone 12 in Fig. 1). The echo comprises part of a far end signal (signal from telephone system 34 in Fig. 1) (ABSTRACT). Examiner notes that Room acoustic echo canceller 24 will function to cancel any acoustic echo coupled from speaker 58 to microphone 12 as well as any electrical echo caused by a hybrid (examiner notes the reading of the term 'hybrid' mentioned above). The function of the echo canceller is to reduce any unwanted portion of the far end signal from the near end signal (from microphone 12). The echo canceller functions by reducing an error term to it's minimum value (Col 6 line 50 to Col 7 line 16). By reducing the error term to it's minimum value, the echo canceller will take into account any echo that is received by the near end signal (whether it is from acoustic coupling or some sort of 'hybrid' between the near-end and far-end paths). The echoes are modeled in parallel (via the series of delay line taps (Fig. 2)) and then simultaneously sent to summer 44 (Fig. 2). Since the echo canceller functions to drive the error signal to zero, it will take into account any effect the far end signal has on the near end signal (via acoustic echo or electrical parasitic echo). However, Eppler does not disclose that the echo comprises a portion of a secondary audio signal that at least contributes to the acoustic echo that the echo canceller cancels.

Finn teaches that in echo canceller systems, a far end signal (voice) and a secondary audio signal may be combined and output to the near end speaker and also output to an adaptive echo canceller in order to reduce the echo that both the voice and secondary audio signal produce in the near end microphone. Finn further teaches the means to combine the primary and secondary signals into a reference signal that is adaptively filtered, and then subtracted from the near end signal (FINN: Col 1 lines 23-44). Examiner notes that the combined far end-secondary audio signal will cause an acoustic echo as well as a hybrid electrical echo caused by any parasitic coupling between the transmit and receive paths. It would have been obvious to one of ordinary skill in the art at the time of this application that a secondary audio signal could be summed with the far end voice signal and the combination sent to the echo canceller (as well as the near end loudspeaker) in order to help remove the echo created in the near end microphone by both signals.

As per **claims 11,22** claims are rejected for the same reasons as claim 1

As per **claim 33**, claim 33 is rejected for the same reasons as claim 1 and the additional teachings from Finn that the primary and secondary signals are combined into a reference signal that is adaptively filtered, and then subtracted from the near end signal (FINN: Col 1 lines 23-44). Both Finn and Eppler disclose single filters implementing single adaptable transfer functions.

As per **claim 37**, claim 37 is rejected for the same reasons as claims 1 and 33.

The combining, filtering and subtracting means are inherent to the system for the purpose of combining, filtering, and subtracting the primary and secondary signals as specified in the rejections of claim 33.

As per **claims 2,18,29**, Eppler discloses that the filter is a finite impulse response filter (Col 6 lines 25-36) (Col 7 lines 17-25).

As per **claims 3,19,30**, Eppler's FIR filter is implemented as a linear transversal filter as seen in Fig. 2 (Col 6 lines 38-51) (Col 7 lines 17-25).

As per **claims 6,15,27**, the system of Eppler and Finn inherently comprises a buffer coupled to (FINN: Fig. 1) the adaptive filter 24 via the receive path and amplifier 76 for the purpose of combining the primary and secondary signals as taught by Finn.

As per **claim 8**, In Eppler's echo canceller (Fig. 1) in view of Finn's teachings, the adaptive filter generates an echo estimate of the combined primary and secondary signals. The cancellation of the echo in the near end signal is a function of the estimated echo (Col 6 lines 37-51) (Col 7 lines 17-25).

As per **claim 9**, Eppler's echo canceller further comprises difference operator 20 (Fig. 1) to subtract the echo estimate from the near end (input waveform at terminal 38 in Fig. 1) signal (Col 6 lines 37-51) (Col 7 lines 17-25).

As per **claim 10**, In Eppler's echo canceller the output of difference operator 44 (Fig. 1) is fed-back to the echo canceller as an error signal for filter adaptation (Col 4 lines 20-39) (Col 6 line 65 to Col 7 line 16).

As per **claims 12,23**, the secondary audio system disclosed by Finn, once combined with the far-end signal, will be broadcast from speaker 22 and a portion of the signal will be acoustically coupled to microphone 24 as acoustic echo.

As per **claims 14,17,20,25,28,31** claims rejected for the same reasons as claims 1 and 9.

As per **claim 36**, In Eppler's method the adaptive filtering of the reference signal (the combination of two signals as taught by Finn) comprises generating an estimate of the echo as a function of the transfer function of the electrical (EPPLER: terminals 36, 38 Fig. 1) and acoustical (EPPLER: microphone 12 and speaker 58) echo paths (Col 6 lines 18-37) with echo cancellers 24,46. Additionally, any electrical echo that is not cancelled by canceller 46 will propagate through to canceller 24. As such, the echo estimate generated by canceller 24 will be a function of the electrical echo, with the electrical echo being a function of the electrical echo path.

3. Claims 13,24, are rejected under 35 U.S.C. 103(a) as being unpatentable over Eppler Jr. et al (5600714) in view of Finn (5706344) as applied to claims 11, 12,22,23.

As per **claims 13,24**, Eppler and Finn disclose claims 11,12,22,23 as noted above, but they do not specify that the secondary audio signal is from a set-top box.

It would have been obvious to one of ordinary skill in the art at the time of this application that any known device could produce a secondary audio signal, such as a set-top box.

4. **Claims 4,21,32,35,39** rejected under 35 U.S.C. 103(a) as being unpatentable over Eppler et al (5600714) and Finn (5706344) as applied to claims 1,11,33,37,22 above, and further in view of Sih (5732134).

As per **claims 4,21,35,39,32**, Eppler and Finn disclose applicant's echo canceller as per claims 1,11,33,37,22. However, they do not teach the echo canceller comprising double talk logic to control the filter adaptation based upon speech in the near end signal. Sih teaches an adaptive echo canceller configuration where the far end speech is used as reference signal to cancel echo, a double talk condition will corrupt the echo path estimate unless the coefficient adaptation of the filter is disabled during the double talk (Col 1 lines 52-67). It would have been obvious to one of ordinary skill in the art at the time of this application to include double-talk logic (by detecting speech in both the near and far end) and cease coefficient adaptation in order to prevent the corruption of the echo path estimate.

5. **Claim 5** rejected under 35 U.S.C. 103(a) as being unpatentable over Eppler et al (5600714) and Finn (5706344) as applied to claim 1 above, and further in view of Sellenslagh et al. (3433898).

As per **claim 5**, Eppler and Finn disclose applicant's echo canceller as per claim 1. However, they do not teach the secondary tone comprising a pulse metering tone. Sellenslagh teaches that in certain telephony systems, it is desirable to generate pulse metering tones to increment call cost meters (Col 1 lines 29-47). It would have been obvious to one of ordinary skill in the art at the time of this application to include pulse metering as

part of the terminal (and part of the secondary signal) for the purpose of controlling toll collection for services rendered to the user of the terminal.

6. **Claims 7,16,26,34,38** rejected under 35 U.S.C. 103(a) as being unpatentable over Eppler et al (5600714) and Finn (5706344) as applied to claims 1,6,11-15,22-25,33,37 above, and further in view of Hasegawa (5905717).

As per **claims 7,16,26,34,38**, Eppler and Finn disclose applicant's echo canceller as per claims 1,6,11-15,22-25,33,37. However, they do not teach including a decimator to downsample the secondary audio signal to match that of the first.

Hasegawa teaches that in an adaptive filter echo canceller, the filter will be required to have a high-speed computation capability unless the rate of the input to the filter is converted (decimated) (Col 1 lines 15-27). It would have been obvious to one of ordinary skill in the art at the time of this application to include a decimator to down sample the primary signal, and also for the secondary signal to the same rate for the purpose of reducing the computation capability (and cost) required by the filter.

Response to Arguments

1. Applicant's arguments with respect to **claims 1-39** have been considered but are not persuasive.

As per applicant's comments in the remarks section (remarks filed 1-29-2007, page 9) that the Hybrid H of Fig. 7 is a hybrid to couple the far end signal. Examiner notes that the far end signal in applicant's figure 7 is the Fin and Sout signals. If those

are coupled to the hybrid, as per applicant's arguments (to make it a far end signal), then the microphone will be summing to a junction with itself and will create feedback. The Hybrid H of Fig. 7 must extend out to a secondary 'far end' signal. Examiner requested applicant to clarify which 'far end' signal is being referred to. Applicant described the circuitry of figure 7 but it still is not clear how the hybrid H carries the same far end signal as is received by interpolator 320 from the far end in applicant's Fig. 7. According to the applicant's Figure 7, the electrical echo would be introduced at the same point as the acoustic echo. The acoustic interface and electrical interface must be separate in order to function correctly. The hybrid H pictured in Fig. 7 appears to be in error. Examiner again asks clarification on this from the applicant.

As per applicant's argument that Eppler does disclose not dynamically cancelling a combination of acoustic and electrical echo, examiner disagrees. Since Eppler takes the reference point of the incoming/outgoing signals before the microphone and speaker, the echo canceller will train (examiner reads the training process as being 'adaptive') to account for any cause of echo because it is comparing the outgoing (to the speaker) signal to the incoming (from the microphone) signal and functioning to drive the error signal to zero. The error signal will comprise echo signals both acoustically coupled and electrically coupled. Furthermore, the examiner contends that the electrical echo from the hybrid of Eppler could propagate through the system and be coupled again acoustically, and then it could be considered both 'acoustical' and 'electrical' echo; and it would be acted upon by Eppler's echo canceller. Examiner notes that Eppler's echo cancellers are adaptive because they adaptive produce echo estimates depending on the

signal that is to be output to the speaker (and is also fed to the echo estimator). Examiner notes that applicant's claimed invention and Eppler's systems are functioning to perform the same task, cancel echoes from incoming (from the microphone/hybrid) signals. The examiner notes that Eppler uses adaptive algorithms to minimize the echo in the feedback signals (going into each canceller after the subtracting step). Eppler discloses that this may be done (Col 7 lines 35-55) while in use and that the training is only used to provide a starting point for the adaptive process which is performed dynamically. Examiner notes that the training procedure itself is also read as 'dynamic'.

As per applicant's arguments that the Sellenslaugh reference does not disclose echo cancellation, examiner contends that Sellenslaugh is relied upon to teach that pulse metering tones are a well known type of tone. Eppler and Finn disclose echo cancellation of a secondary audio signal.

As per applicant's arguments that Hasegawa does not teach the same decimation and interpolation and applicant's claimed invention. Examiner contends that the 103 combination of references does disclose that. One of ordinary skill in the art would have known that two parallel processes could be interpolated/decimated in order to utilize the same processing architecture. Finn already discloses the combination processing of the primary and secondary audio signals. As per applicant's comments that 'buffering is not necessary', examiner reads 'buffering' and any means to store the individual data bits as

they are being processed (there will always be processing delays for each function performed on the incoming and outgoing data, the data must be buffered and synchronized in order for the device to function). Examiner contends that the act of decimating and interpolating is the same in Hasegawa as it is in applicant's claims, but Hasegawa performs the acts on a different type of data than claimed by applicant. However, Hasegawa combined with Eppler and Finn would read on applicant's claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 571-272-7498. The examiner can normally be reached on M-F 9AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 571-272-7499. The fax phone numbers for the organization where this application or proceeding is assigned are **571-273-8300** for regular communications and **571-273-8300** for After Final communications.

Examiner Alexander Jamal



December 1, 2007